



SPHENIX Clusterizer Overview

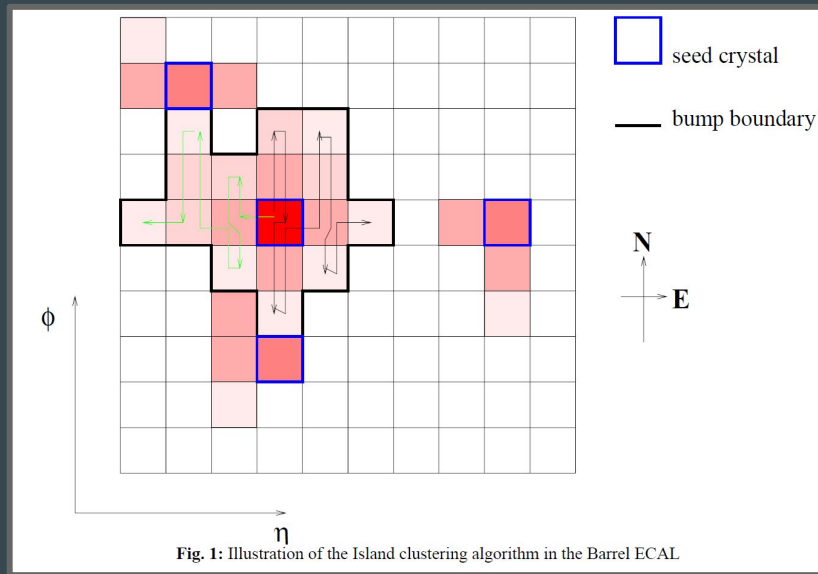


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EMCal Workfest
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The Island Algorithm at CMS

Procedure:

1. Store “seed” towers. Defined by $E_T > E_T^{\text{thresh}}$
2. Remove seeds adjacent to higher energy ones.
3. Starting from highest energy seed:
 - a. Move both directions in ϕ until rise in energy or hole.
 - b. Move one step in η . Repeat ϕ search.
 - i. Continue along η until energy rise or hole.

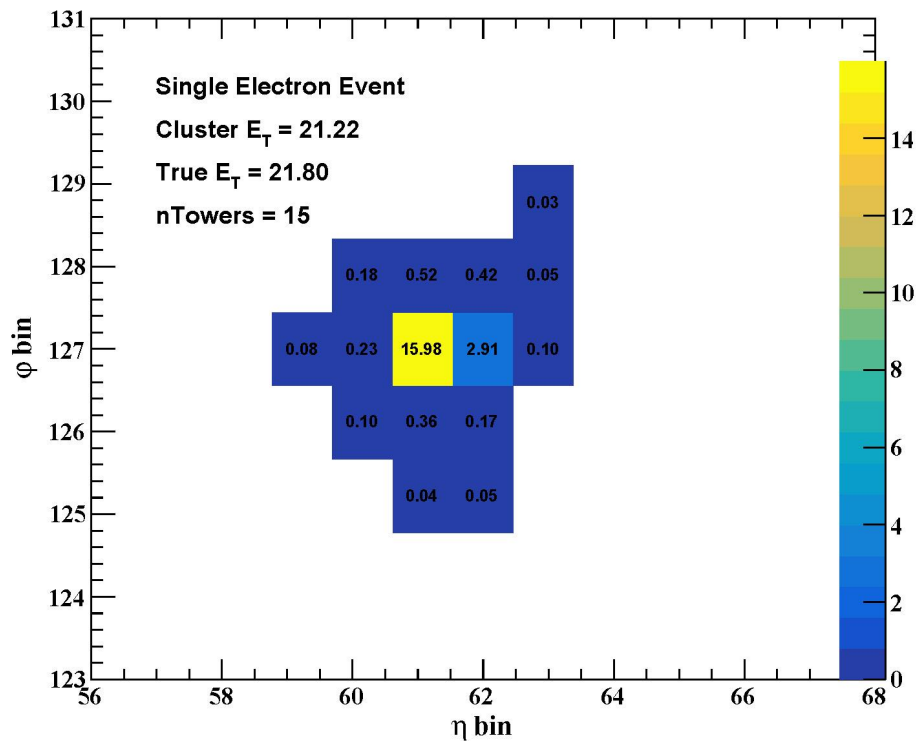


Single-Particle Event Simulations

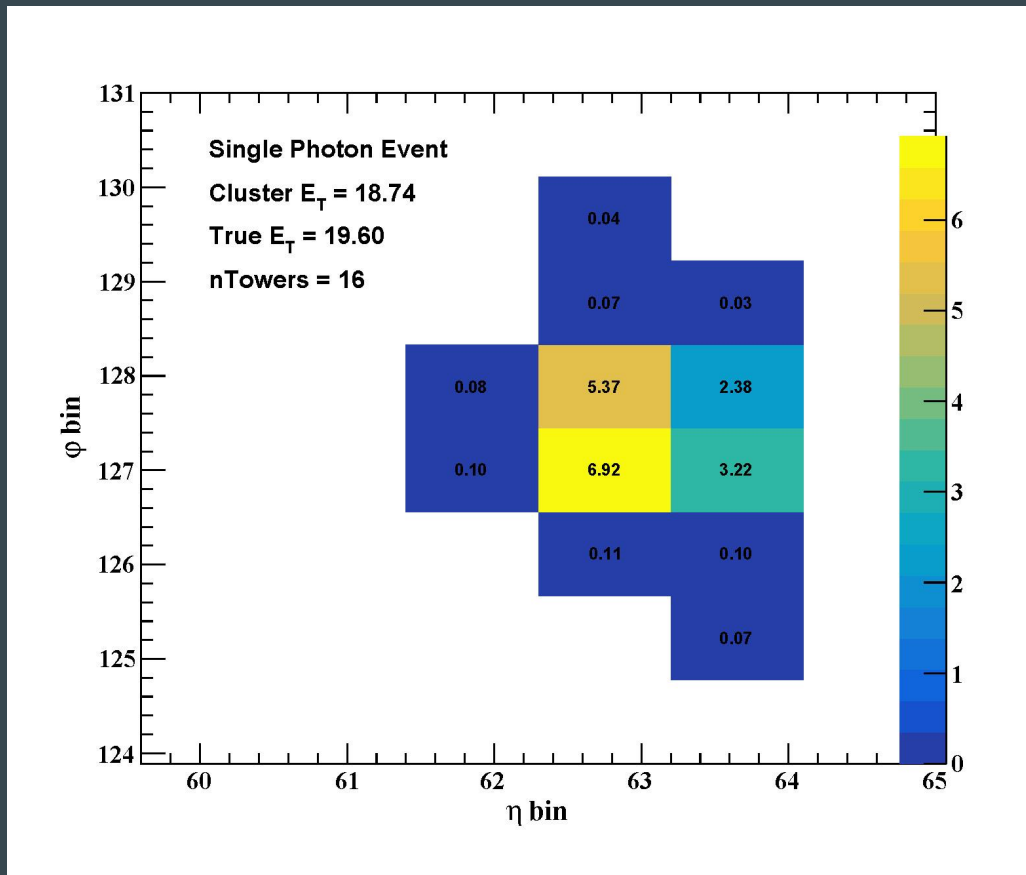
General procedure used for *all* slides that follow:

1. Use PHG4SimpleEventGenerator in [Fun4All_G4_sPHENIX.C](#) to generate one particle in one event.
 - a. Particles of interest: electrons, photons, and neutral pions.
 - b. Generated particle fixed at $(\eta, \phi) = (0, 0)$ for simplicity.
 - c. Set particle p_T to fixed value. Explored here: $5 \text{ GeV}/c < p_T < 60 \text{ GeV}/c$.
 - d. Build cluster(s) in [RawClusterBuilderIA::process_event\(\)](#).
2. Repeat many times for different values of generated particle p_T using [bash script](#) (clunky!).

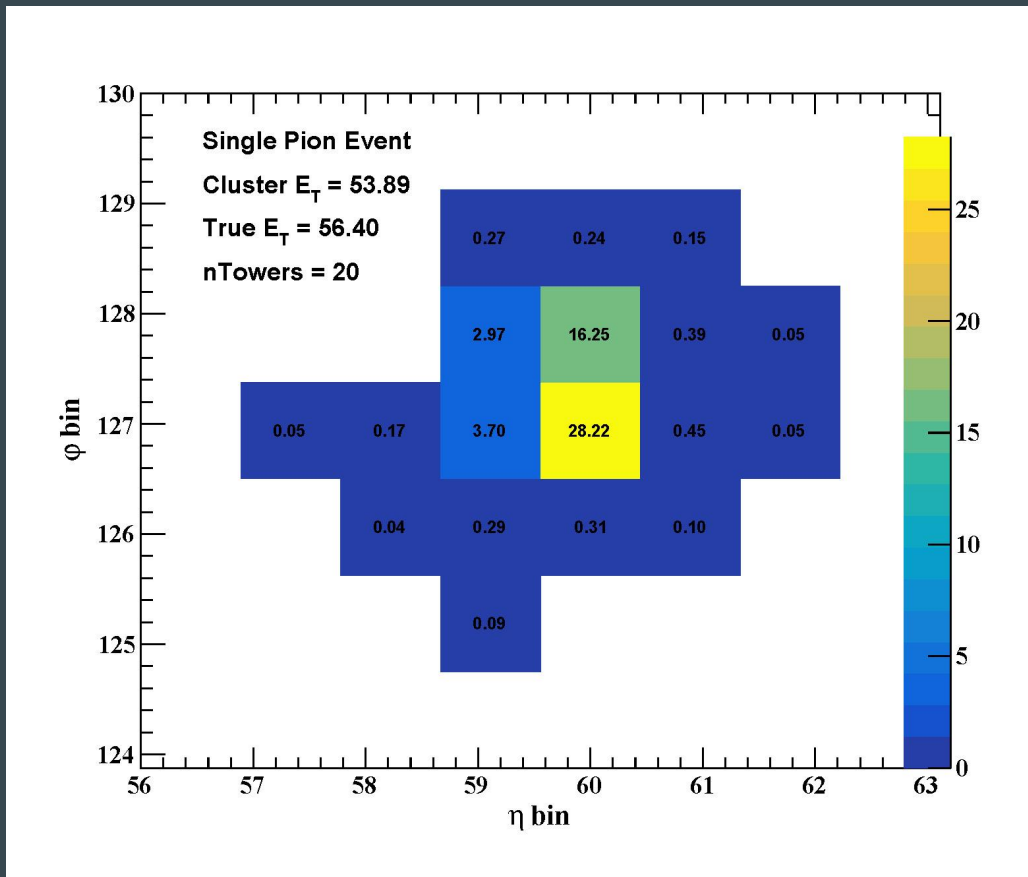
Example Cluster Visualizations - Electrons



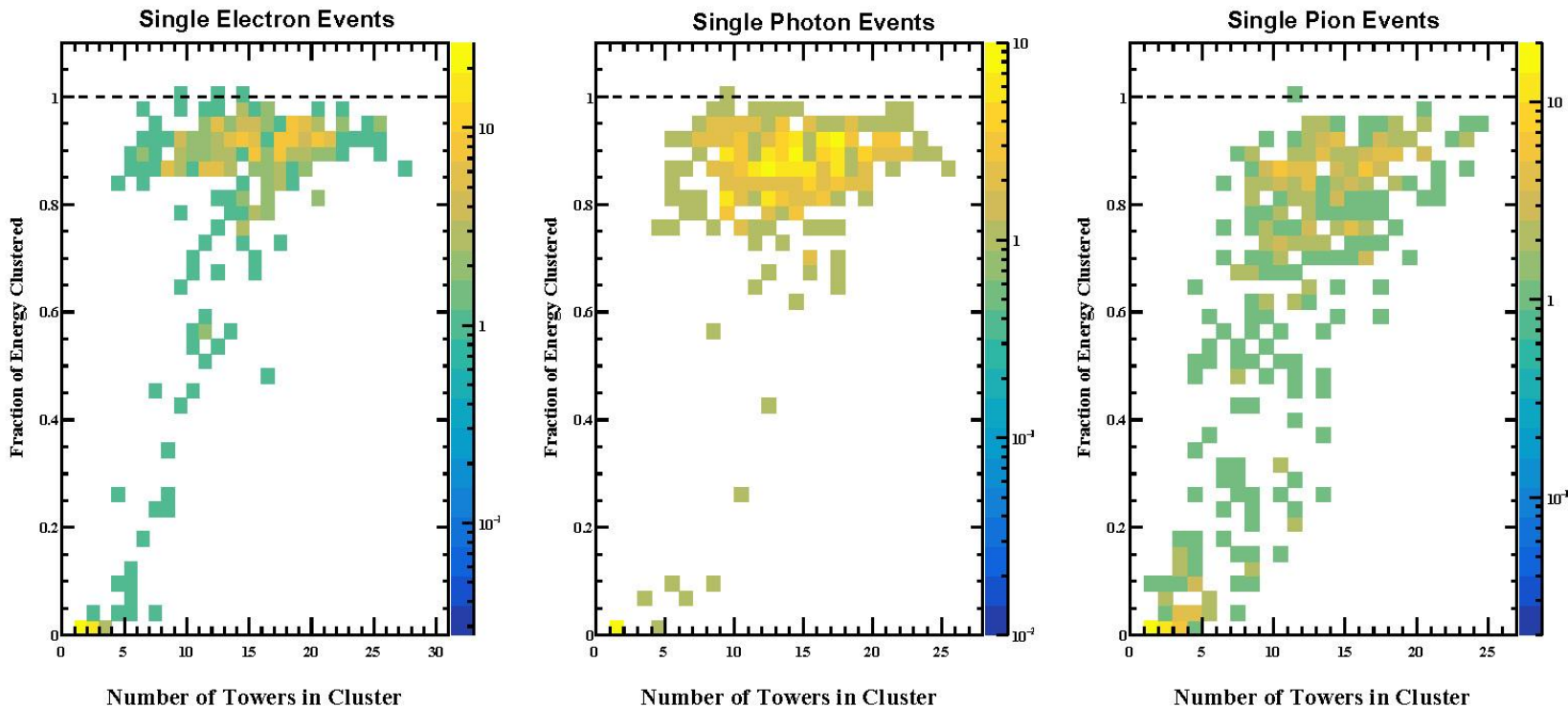
Example Cluster Visualizations - Photons



Example Cluster Visualizations - Neutral Pions



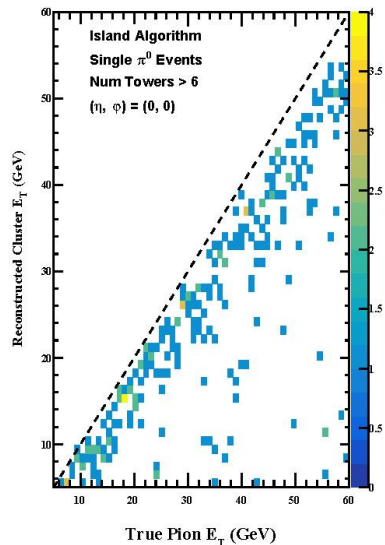
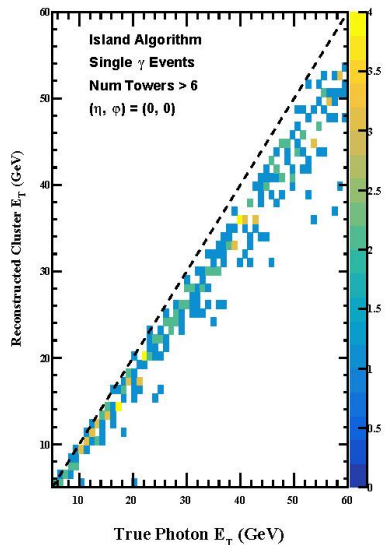
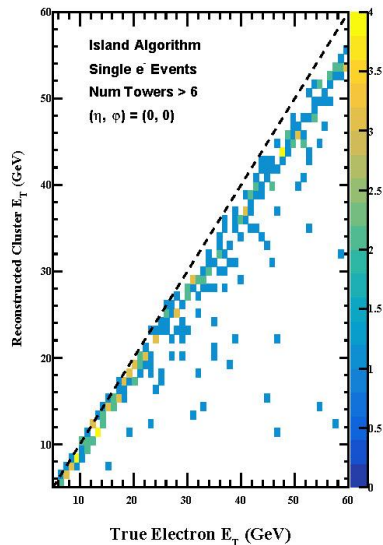
Exploring Cuts: $E_T^{\text{cluster}}/E_T^{\text{true}}$ vs. Num Towers



Clustered E_T vs. Generated E_T

For each of e^- , γ , and π^0 :

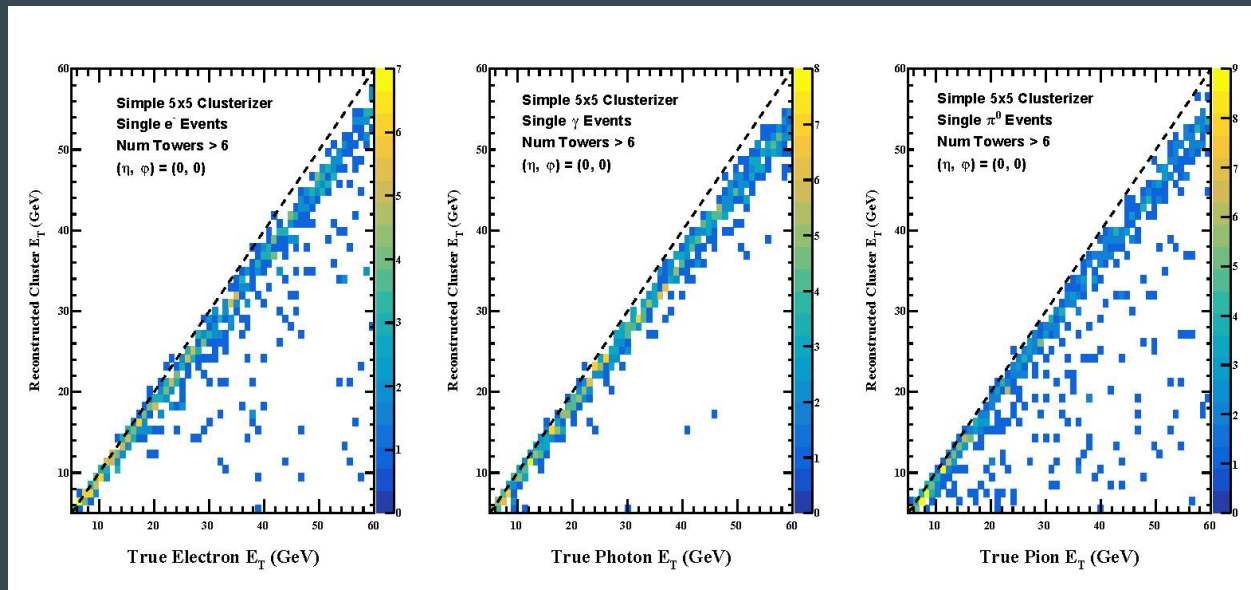
- Generate one single-particle event
 - $(\eta, \phi) = (0, 0)$
 - known p_T
 - noise included
- Accept clusters with NTowers > 6.
- Plot the cluster E_T that was found



Comparison with Simple 5x5 Clusterizer

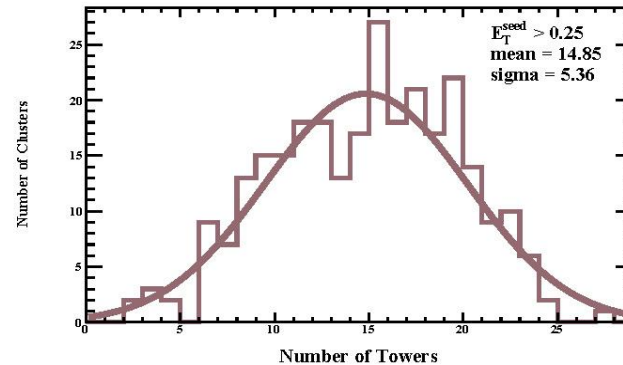
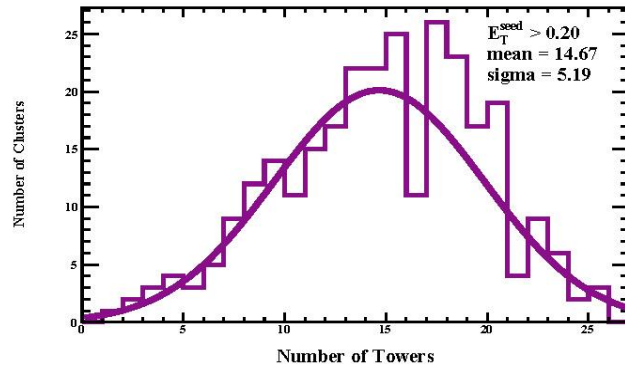
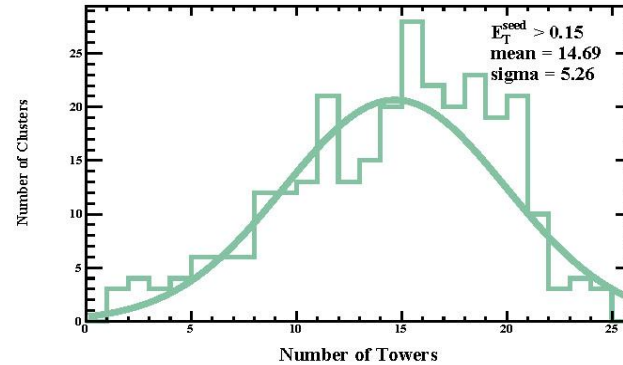
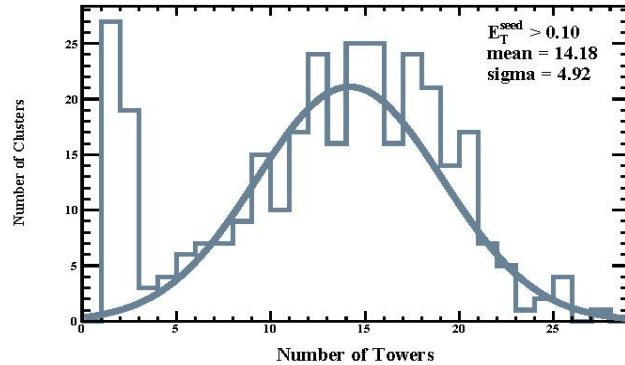
For each of e^- , γ , and π^0 :

- Collect seed towers.
- Construct simple 5x5 clusters centered on each seed.

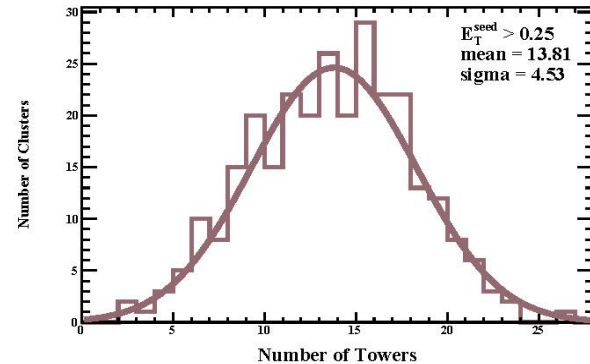
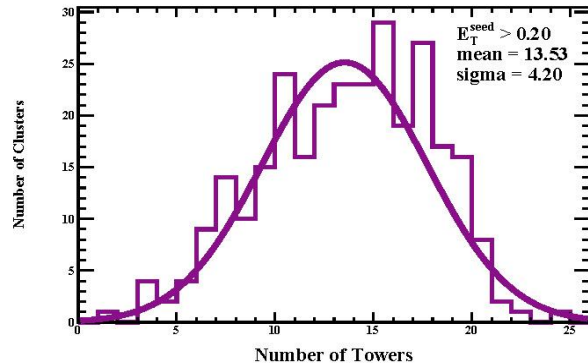
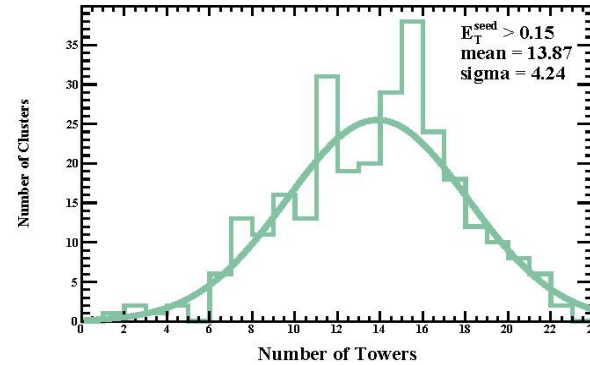
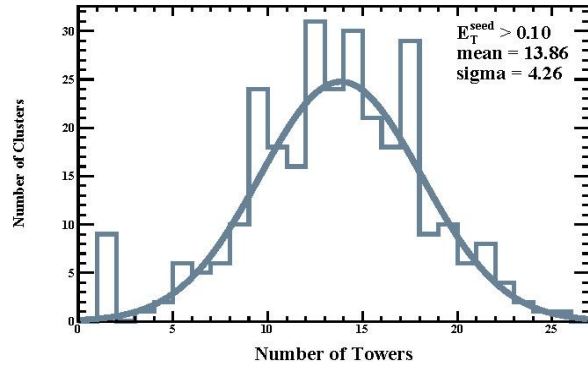


Varying Seed E_T Threshold

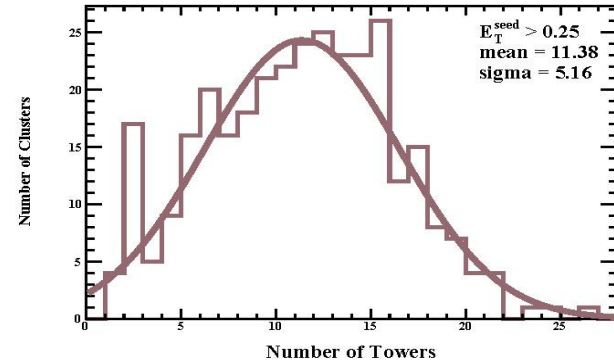
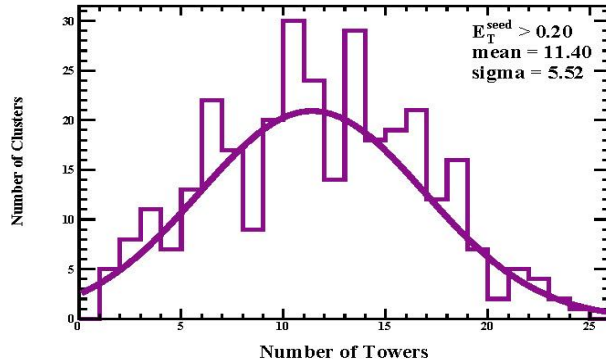
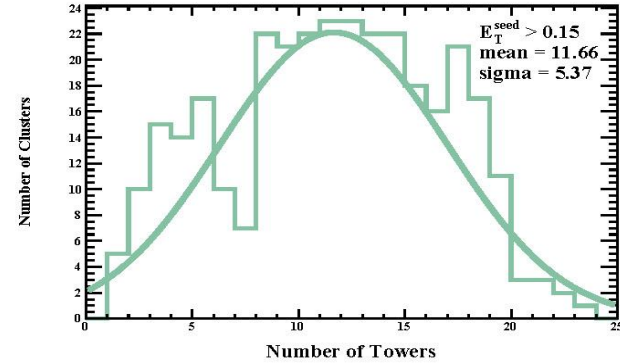
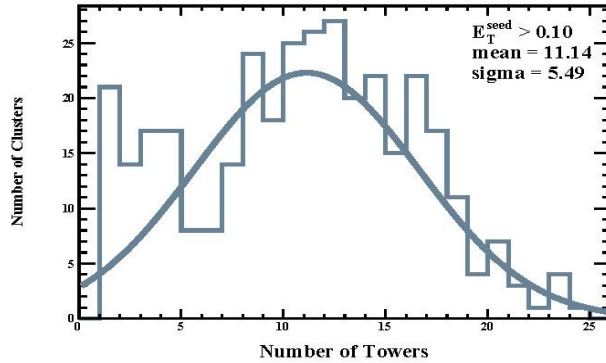
Varying Seed E_T Threshold - Electrons



Varying Seed E_T Threshold - Photons



Varying Seed E_T Threshold - Neutral Pions



Current Status

- Integrating 'RawClusterBuilderIA' repository ([link](#)) into coresoftware.
- Writing more plotting macros to analyze output clusters ([link to plotting repo](#)).
- Documenting work/code as much as possible should others read/modify it in the future.